chapter two

Transportation System Use and Performance

In 1997, the U.S. transportation system supported 4.4 trillion miles of passenger travel and about 4 trillion ton-miles of goods movement. This chapter describes how the system is used and how it performs.

PASSENGER TRAVEL

Passenger travel in the United States, measured by local and long-distance trips, has increased during the past two decades (see table 2-1). The U.S. Department of Transportation's (DOT's) Nationwide Personal Transportation Survey (NPTS), which looked at local travel primarily, shows an 82 percent rise in the number of daily person-miles of travel from 1977 to 1995, and a 79 percent rise in the number of daily trips.[1] In 1977, the average number of daily trips a person made totaled 2.9, compared with 4.3 in 1995. In the NPTS, a trip is movement from one address to another by any mode. Average trip distance was about 9 miles in both survey years. Because people took more trips in 1995, individuals averaged about 14,100 miles on

[1]The NPTS was first conducted in 1969, and then again in 1977, 1983, 1990, and 1995. Numerous methodological improvements in the NPTS and a changing response profile between 1977 and 1995 make trend analysis somewhat risky, but travel behavior for these two points in time are adequately (if not perfectly) reflected in the survey data. Data used are from the travel-day file, which includes trips of all lengths made by respondents on a single day. About 95 percent of these trips were 30 miles or less.

Table 2-1
Population and Passenger Travel in the United States: 1977 and 1995

	1977	1995	Percentage change 1977–95
Resident population (thousands)	219,760	262,761	20
Annual local person trips (travel day) (millions)[1]	211,778	378,930	79
Annual long-distance person trips, domestic (millions)	521	1,001	92
Local person trips per capita, one way (per day)[1]	2.9	4.3	47
Long-distance trips per capita, roundtrip (per year)	2.5	3.9	56
Local person-miles (millions)[1]	1,879,215	3,411,122	82
Long-distance person-miles (millions)	382,466	826,804	116
Local person-miles per capita[1] (annually)	9,470	14,115	49
Long-distance person-miles per capita, domestic (annually)	1,796	3,129	74
Local mean trip length (miles)	8.9	9.0	1
Long-distance mean trip length, domestic (miles)	733	826	13

[1]Persons over 5 years of age.

NOTES: Data used for local travel are from the travel-day file and include trips of all lengths made by respondents on a single day. About 95 percent of these trips were 30 miles or less. Per capita calculations are based on population estimates within each survey, and not from Census Bureau estimates reported here.

SOURCES: U.S. Department of Transportation, Bureau of Transportation Statistics, American Travel Survey data, October 1997.

U.S. Department of Commerce, Census Bureau, *National Travel Survey, Travel During 1977* (Washington, DC: 1979).

_____. *Statistical Abstract of the United States 1998* (Washington, DC: 1998).

U.S. Department of Transportation, Federal Highway Administration, Summary of Travel Trends: 1995 Nationwide Personal Transportation Survey, draft, 1999.

local travel or 39 miles daily, compared with 9,500 miles in 1977, or 26 miles a day (USDOT FHWA 1999a).

Long-distance roundtrips nearly doubled between 1977 and 1995, as shown in the Bureau of Transportation Statistics' American Travel Survey (ATS) and the Bureau of the Census' earlier National Travel Survey.[2] Domestic long-distance travel rose from 1,800 miles annually per person in 1977 to 3,100 in 1995, up 74 percent. The average number and length of long-distance trips taken per person increased from 2.5 (733 miles) in 1977 to 3.9 (826 miles) in 1995. Totaling long-distance and daily travel shows that American's averaged about 17,200 miles in 1995, up 53 percent from 11,300 miles in 1977. About 75 to 80 percent of this travel is local (trips under 100 miles one way), but long-distance travel grew more quickly. It must be noted, however, if NPTS travel-day data are added to ATS data, a small amount of double counting occurs because NPTS data include some trips of 100 miles or more. Moreover, neither survey adequately captures trips between 30 and 99 miles, resulting in an undercounting of total travel and an overrepresentation of long-distance travel in the total.

Several factors account for the growth in travel, most importantly greater vehicle availability

[2]The methodology of the 1995 ATS was similar to the 1977 National Travel Survey. In both surveys, long distance was defined as trips 100 miles or more one way.

and reduced travel cost. People could afford to buy more vehicles and travel services in 1995 than in 1977, especially since the cost of the most widely used kinds of transportation—cars and planes—fell in real terms. The inflation-adjusted cost of owning and operating an automobile declined from 47¢ per mile in 1975 to 39¢ per mile in 1995. The average airfare declined from $100 in 1975 to $70 in 1995 (both measured in constant 1982–1984 dollars) (USDOT BTS 1998a), while trip lengths increased. Furthermore, both intercity bus and train fares increased slightly more than inflation over this period, which affected lower income persons who use buses more often than other people.

Other factors influence travel growth in a less obvious manner. With a U.S. resident population nearly 20 percent higher in 1995 than in 1977, comparable travel growth might be expected if no other factors changed. Some growth can be attributed to greater labor force participation; the labor force rose 36 percent during this period as baby boomers (those born between 1946 and 1964) took jobs and more women joined the workforce. In addition, the number of households rose 34 percent, resulting in more trips to buy groceries and other households items. Notably, disposable personal income per capita rose 34 percent in real terms (measured in chained 1992 dollars), from $14,100 in 1977 to $18,900 in 1995, giving people a greater ability to pay for transportation (USDOC 1998, 456).

Although household size declined by 7 percent between 1977 and 1995, the number of vehicles per household increased from 1.59 to 1.78 (USDOT FHWA 1997a). Households with two vehicles rose by 54 percent, from 26 million households in 1977 to 40 million in 1995, and households without vehicles declined from 11.5 million in 1977 to 8 million in 1995. The number of licensed drivers increased by nearly 50 million from 128 million in 1977 to 177 million in 1995, and the proportion of the population 16 years and older licensed to drive rose from 81 percent to 89 percent.

Travel Mode

Most passenger trips (nearly 90 percent of daily trips and 92 percent of miles traveled) are made in automobiles or other private motorized vehicles (see table 2-2). The share for other modes was considerably smaller—bicycling and walking accounted for 6.5 percent of local trips and 0.5 percent of miles, and transit's share was about 4 percent of trips and 3 percent of miles. The NPTS shows that local private vehicle trips grew more rapidly than overall local trips (111 percent compared with 79 percent). In 1995, the average household made 6.4 local private vehicle trips, up from 4.0 in 1977. Households averaged 57 local miles daily in private vehicles in 1995, 24 more miles than in 1977.

Table 2-2
Daily and Long-Distance Trips by Mode: 1995

Daily trips	Percent
Personal-use vehicle	89.5
Transit	3.6
Bicycle/walking	6.5
Rail	0.01
Other	0.3

NOTE: Transit includes commuter rail.

Long-distance trips	Percent
Personal-use vehicle	79.2
Airplane	18.0
Bus	2.1
Rail	0.5
Other	0.2

SOURCES: U.S. Department of Transportation, Bureau of Transportation Statistics, American Travel Survey data, October 1997.

U.S. Department of Transportation, Federal Highway Administration, Summary of Travel Trends: 1995 Nationwide Personal Transportation Survey, draft, 1999.

Table 2-2 also shows a ranking of modes used for long-distance travel. Although travel by bus ranks a distant third and rail maintains an even smaller share, between 1977 and 1995, long-distance person-trips by bus increased by 43 percent and those by train increased by 23 percent. The per capita number of bus trips increased by 20 percent, while those by train remained constant.

Trip Purpose

Data from the ATS and the NPTS can illustrate not only how people travel, but why. Family and personal business made up the greatest share of local trips (55 percent). Long-distance trips to visit friends and relatives held a 33 percent share, while business-related trips (including commuting and business travel) accounted for about the same proportion—just over 20 percent—of both local and long-distance trips.

Between 1977 and 1995, the most growth in *daily travel* per person took place in trips for family and personal business, which more than doubled, and trips for social and recreational purposes, which increased 51 percent. Trips to or from work per person grew by 33 percent, while school or church-related trips grew only 9 percent (USDOT FHWA 1999b). Over the same period, *long-distance trips* for personal business, business, and leisure experienced the most growth. Trips to visit friends and relatives also grew, albeit more slowly than other types of trips; thus, the share declined from 37 percent of all long-distance trips to 33 percent (USDOT BTS 1997; USDOC 1979).

Trip Chaining

People often link local trips together in what is know as trip chaining (e.g., dropping a child off at school before traveling to work). In an analysis of trip chaining involving home-to-work and work-to-home trips using 1995 NPTS data, one report found that people are more likely to stop on their way home from work than on their way to work, and that women are more likely to trip chain than men (McGuckin and Murakami 1999). About 33 percent of women linked trips on their way to work compared with 19 percent of men, while 61 percent of women and 46 percent of men linked trips on their way home from work.

Trip chaining is thought to be increasing because of rising incomes, the entry of women into the workforce, and the increasing use of automobiles (McGuckin and Murakami, 1999). Many household-sustaining goods and services are now often bought rather than provided in the home (e.g., child care and meals), because more time is spent at work and less time is available for family-oriented needs. As a result, people are making extra trips, and these trips are very often chained with the work commute to save time. In addition, the ability to link trips is enhanced by the flexibility provided by the automobile. Linking nonwork-related trips with the work commute has been posited as one reason for increased congestion problems at rush hour (Strathman and Dueker 1995).

Commuting

Time spent traveling to work has increased 36 percent since 1983 (the most recent year for which commute data are available). Commuters spent, on average, 21 minutes traveling to work in 1995, an increase of 13 percent over this period. The average work trip rose from 8.5 miles in 1983 to 11.6 miles in 1995. Research on trip chaining suggests that commute time and distance are underestimated, because only the last leg of a trip chain to work is measured. No data are available from the 1995 NPTS, but 1990 NPTS data show that when trip chaining is taken into account time and distance to work are about 5 percent higher than otherwise estimated (Strathman and Dueker 1995).

Average commute speeds rose from 28 miles per hour (mph) in 1983 to 34 mph in 1995 (a 20 percent increase). Average speed, of course, varied, from 40 mph in rural areas to 24 mph in urban areas. Longer but faster commuting trips are partly a reflection of continued decentralization of metropolitan areas and a switch from slower modes of transportation such as carpools to the faster single-occupant vehicle trips. In 1995, most people traveled to work by personal-use vehicle (PUV), with 1 out of 10 carpooling. Carpooling has declined from about 15 percent in 1977. In 1995, about 5 percent reached work by transit and another 4 percent by other means (e.g., walking and biking). These proportions have been reasonably stable since 1977.

Mobility Patterns

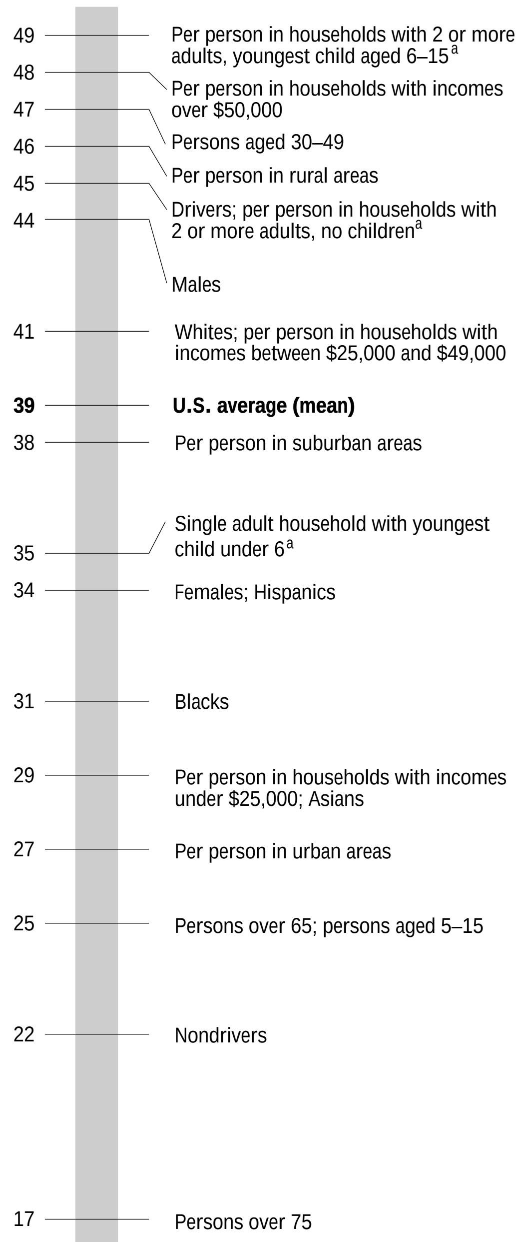
Among different segments of the population, wide variations exist in the number of trips taken and the miles traveled. Figures 2-1 and 2-2 illustrate these variations by income, sex, age, and race/ethnicity.

► Females and Males

The NPTS shows that males travel greater distances overall—both local and long-distance—than females. Although both groups averaged 4.3 local trips a day, men traveled 10 miles more than women—44 miles compared with 34 miles. The difference was the result of longer trips by males, not the type of transportation used (which was about the same for both sexes). The average distance of a PUV trip by males was 10.7 miles compared with 8.4 miles by females, and the average transit trip was 9.4 miles for males and 8.2 miles for females.

By trip purpose, table 2-3 shows that the only category where females made a greater propor-

Figure 2-1
Person-Miles Traveled per Day: 1995

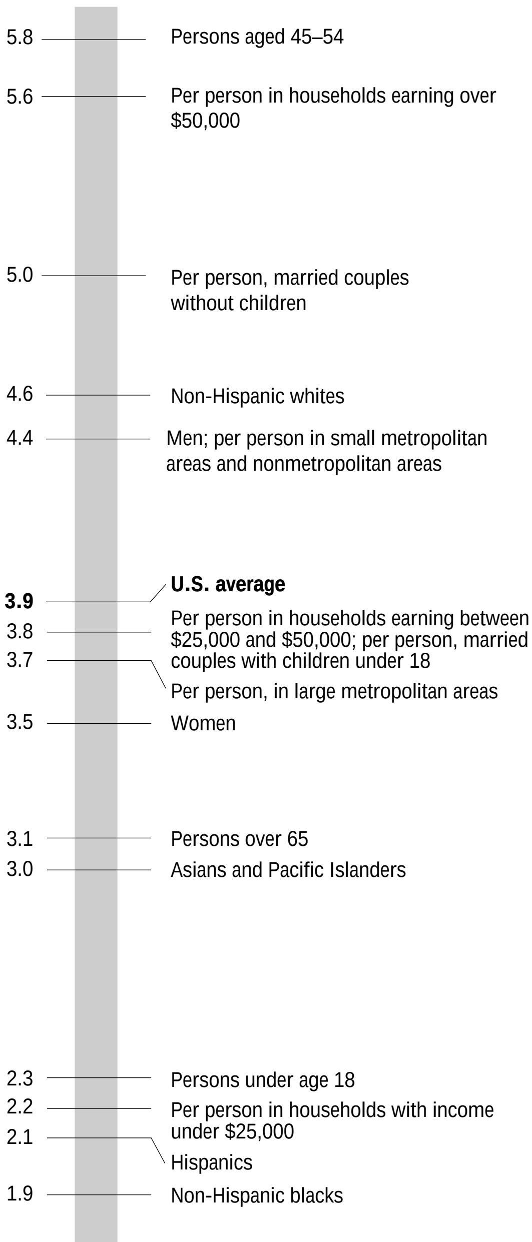


[a] Per adult 20 years or older

NOTE: Some numbers may not differ statistically.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Nationwide Personal Transportation Survey, Our Nation's Travel* (Washington, DC: 1997).

Figure 2-2
Long-Distance Trips per Person: 1995[a]



[a] These numbers differ from those presented in figure 6-9 in *Transportation Statistics Annual Report 1998* and reflect demographic data released in 1999.

NOTE: Some numbers may not differ statistically.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, American Travel Survey data, October 1997.

Table 2-3
Person Trips per Day by Purpose and Sex: 1995 (travel day)

	Male	Female
Per capita person trips per day	4.3	4.3
Purpose:		
To or from work	21%	15%
Work-related business	4%	2%
Family and personal business	41%	50%
School/church	9%	9%
Social and recreational	26%	24%

SOURCE: U.S. Department of Transportation, Federal Highway Administration, Nationwide Personal Transportation Survey data (travel day), available at www-cta.ornl.gov/npts/1995/Doc/index.shtml, as of Aug. 9, 1999.

tion of trips was for family and personal business—50 percent vs. 41 percent.

Females traveling long-distance in 1995 took, on average, 3.5 roundtrips and males 4.4 roundtrips. The average trip distance was about the same for men and women in 1995 at about 800 miles. About three-quarters of the difference in the number of long-distance trips can be explained by greater business travel by men, with most of the rest resulting from more outdoor recreational travel among men. The modal choice of males and females for long-distance trips was very similar. Both made about 80 percent of their trips by PUV, while women made a slightly higher percentage of their trips by charter or tour bus and men made a slightly higher percentage by air. There were no discernable differences between men and women in the use of intercity bus, train, ship, boat, or ferry (Mallett 1999).

► Income

People in households with higher incomes travel more. In households earning less than $5,000 annually, the NPTS shows the lowest local trip rate, 3.2 trips per person per day in 1995. The number of trips rose to about 4.0 for people in households earning between $15,000 and $20,000, and plateaued at an average of 4.6 trips for people in households earning $30,000 or more. Somewhat similarly, miles traveled also rose with income. People in households earning less than $25,000 a year traveled 29 miles a day. In the $25,000 to $50,000 a year category, people traveled 41 miles a day, and those in households earning more than $50,000 annually traveled 48 miles a day. People in very high income households, those earning $100,000 or more annually, made 4.8 local trips and traveled 53 miles a day.

The difference among income groups appears to be greater for long-distance travel than for daily travel. People in households earning $50,000 or more made 5.6 long-distance trips in 1995 totaling 4,900 miles annually on domestic trips. This compares with 3.8 trips and 2,700 annual miles by people in households earning between $25,000 and $50,000, and 2.2 trips and 1,500 miles by people earning below $25,000.

► Race / Ethnicity

The differences in daily travel among racial and ethnic groups are more readily apparent for miles traveled than for tripmaking. Whites traveled farther, averaging 41 miles a day locally (4.4 trips), compared with 34 miles (4.2 trips) for Hispanics, 31 miles (3.9 trips) for blacks, and 31 miles (3.9 trips) for Asians. Long-distance trip taking in 1995 shows a wider variation with non-Hispanic whites taking more than twice the number of long-distance trips as non-Hispanic blacks (4.6 person-trips per capita versus 1.9) and Hispanics (2.1 trips per capita). Asians and Pacific Islanders made 3.0 person trips per capita on average.

► Age

As might be expected, children and the elderly travel the least. In 1995, children aged 5 to 15 traveled 25 miles a day. Travel distance increased with age to a plateau of 47 miles on average for people between 30 and 49, and then decreased to the same level as child travel—25 miles a day for people over 65. Again, with trips per day, children between 5 and 15 and people over age 65 averaged fewer trips per day (3.7 and 3.4, respectively) with those between 35 and 44 taking the most trips a day (4.9). People over 85 travel the least, taking 1.5 trips a day.

While individuals averaged nearly 4 long-distance trips each in 1995, the highest propensity to travel was found among 45-to 54-year-olds (5.8 trips per capita), followed by those aged 55 to 64 and 35 to 44. As in the local trip category, the youngest (under 18) and oldest members of the population traveled the least. There is, however, much variation among the older population, which encompasses people from age 65 to over 100. People over 65 took on average 3.1 trips in 1995, fewer than all other age groups except those under 18 and about half the number of trips of those in the 45 to 54 age bracket. Those aged 65 to 69 made on average 4.4 trips per year, while people over 85 years old averaged only 1.2 trips annually.

► Geography

The 1995 NPTS provides data on the type of area respondents lived in including urban, suburban, rural, second city, and small town.[3]

[3] The NPTS includes an urban to rural classification based on population density per square mile (centiles) and the density of surrounding areas. According to the NPTS: "To establish this classification, the United States was divided into a grid to reduce the impact of variation in size (land area) of census tracks and block groups. Density was converted into centiles, that is, the raw numbers (persons per square mile) were translated into a scale from 0 to 99. 'Rural' (centiles 19 and less) and 'small town' (centiles 20 to 39) definitions are based solely on the density. Population centers were defined if a route through the eight neighboring cells could be constructed in which the density of successive cells was decreasing or equal. Population centers with centiles greater than 79 were designated 'urban.' Other centers were classified as 'second cities,' places that are near an urban center but with a density greater than the typical suburb. Finally, 'suburban' areas of the population centers were defined, using both the cell density and the cell's density relative to the population center's density" (USDOT FHWA 1997b). The geographical breakdown in the ATS is limited to large metropolitan areas (population of 250,000 or more) and small metropolitan/nonmetropolitan areas (less than 250,000 people).

People in a second city (places such as Gaithersburg, Maryland, and Huntingdon, New York) made the most trips (4.5 a day), followed by residents of suburbs (4.4), small towns (4.3), rural areas (4.2), and urban areas (4.0). The most miles of travel per day, however, were by rural residents (46 miles) followed by town (42 miles), suburban (38 miles), second city (37 miles), and urban (27 miles).

Data from the ATS allow comparison of the long-distance travel behavior of people who live in large metropolitan areas (population of 250,000 or more) with people in small metropolitan areas (population under 250,000) and nonmetropolitan areas. Individuals in small metropolitan/nonmetropolitan (SM/N) areas averaged 4.4 long-distance trips in 1995 compared with 3.7 for people in large metropolitan areas, suggesting that SM/N area residents take some long-distance trips to reach opportunities that are nearby in large metropolitan areas. Trip distance data show that people in large metropolitan areas travel farther than their SM/N counterparts when taking domestic trips (a mean of 920 miles compared with 650 miles), hence, average annual person-miles on domestic trips for large-metropolitan residents was 3,300 miles and for SM/N residents about 2,800 miles.

International Long-Distance Trips

The 1995 ATS found that U.S. residents made 41 million long-distance trips (100 miles or more one way) to foreign destinations, about 4 percent of all long-distance trips. About 28 percent of these long-distance trips were to Canada, 23 percent to Mexico, and the remaining 49 percent to the rest of the world. It must be remembered, however, that this does not take into account trips across the border that were less than 100 miles one way. Excluding North American travel, Europe was the most popular destination of U.S. residents (18 percent of all international trips), followed by the Caribbean (11 percent), and Asia (8 percent).

DOMESTIC FREIGHT

Business establishments in the United States shipped much more commercial freight on the nation's transportation system in 1997 than in 1993, the two most recent years for which comprehensive freight data are available. Freight shipments increased about 17 percent by value, 14 percent by tons, and 10 percent by ton-miles. Preliminary estimates by the Bureau of Transportation Statistics (BTS) show that nearly 14 billion tons of goods and raw materials, valued at nearly $8 trillion, moved over the U.S. transportation system in 1997, generating nearly 4 trillion ton-miles.[4] About 38 million tons of commodities worth nearly $22 billion moved on the nation's transportation system per day in 1997.

Growth in Freight Movement

This section discusses domestic freight movement using preliminary results from the 1997 Commodity Flow Survey (CFS) conducted by BTS and the Census Bureau, plus additional data. Where possible, it also discusses changes in freight movement since 1993 using data from the 1993 CFS. (See box 2-1 for a discussion of the CFS, including what the survey covers, what it excludes, and the supplementary data included in the estimates this section presents.)

Millions of American businesses rely on the U.S. transportation network to ship their products to other businesses, to consumers, and markets here and abroad. Per capita daily freight

[4] These BTS estimates are based on preliminary information from the 1997 Commodity Flow Survey (CFS), which is designed to cover shipments within the United States by domestic establishments, plus additional estimates of shipments such as imports by air and water transportation not fully captured by the CFS.

Box 2-1

The Commodity Flow Survey and Supplementary Freight Data

Most of the national estimates of freight movement presented in this report are based on preliminary results from the 1997 Commodity Flow Survey (CFS), conducted by the Bureau of Transportation Statistics (BTS) and the Census Bureau, and additional estimates of freight shipments that are not fully measured in the CFS. Conducted for the first time in 1993 and again in 1997, the CFS is the nation's primary and most comprehensive data source on domestic freight movement. It surveys a sample of shipments by domestic establishments engaged in manufacturing, mining, wholesale trade, retail trade, and some selected services. The CFS collects information about what modes these establishments used to ship their products and materials, the types of commodities they shipped, and the value, weight, distance, origin, and destination of the shipments. The survey collects information on freight moved by each mode of transportation, and on freight moved by intermodal combinations (e.g., truck and train).

Although the CFS is the most comprehensive source of data on the domestic movement of goods and materials, some industries and commodities and most domestic movement of imports are not included. Thus, BTS has sought to fill in some of the missing pieces, such as crude petroleum pipeline shipments, some waterborne freight, and out-of-scope imports by surface, air, and water, in both the 1997 and 1993 estimates of commodity flows. This supplementary data can be used to compare the magnitude of overall national freight shipments in 1993 and 1997, but not to estimate specific commodities, sizes, or average length of haul.

Even with supplementary data, the existing data do not cover all freight movement on the nation's transportation network. Data on shipments by establishments included in the Standard Industrial Classification under farms, forestry, fishing, governments, construction, transportation, and most retail and service industries, municipal solid waste, and household movers are not available.

The completeness of estimates is due to revisions in the supplementary data to reflect refinements in methodology to include previously unavailable import data, and to address changes in the CFS coverage. Most of the 1993 data presented in this report are revised and differ from previous estimates for 1993 published by BTS and the Census Bureau. The Census Bureau revised some 1993 figures to make them directly comparable to the 1997 CFS results and BTS revised its supplementary data to improve its estimates. The revised data are noted where appropriate. The Oak Ridge National Laboratory (ORNL) prepared estimates for BTS of the value, tons, and ton-miles of crude petroleum and petroleum products shipments by pipelines and some waterborne shipments not captured in the CFS. ORNL converted Federal Energy Regulatory Commission (FERC) information on barrels of petroleum and petroleum products transported into tons and ton-miles. Estimates of value, tons, and ton-miles of waterborne shipments not captured in the CFS are based on information from the U.S. Army Corps of Engineers and the Department of Commerce's International Trade Division.

moved for each U.S. resident grew to 280 pounds in 1997 from about 250 pounds in 1993.

Goods and raw materials shipped to factories and wholesale and retail outlets throughout the nation generated almost 4 trillion ton-miles in 1997 compared with 3.6 trillion ton-miles in 1993. Most modes showed an increase in ton-miles (see table 2-4). Shipments by air (including those involving truck and air) grew the most in ton-miles (86 percent), followed by parcel, postal, or courier services (41 percent), and truck (26 percent). Ton-miles by rail (including truck and rail) increased by only 7 percent and ton-miles by water decreased by about 3 percent.

Multimodal transportation (shipments reported as moving by more than one mode) increased substantially between 1993 and 1997 from $726 billion to $955 billion in constant 1997 dollars (USDOC 1995; 1999). Multimodal shipments grew about 32 percent by value, 17 percent by tons, and 20 percent by ton-miles. Of these shipments, those made by parcel, postal, or courier services (which typically move higher value and smaller size shipments) grew the most rapidly,

Table 2-4
Domestic- and Export-Bound Freight Shipments within the United States: 1993 and 1997

	Value (millions of chained 1997 $)			Tons (thousands)			Ton-miles (millions)		
Mode	1993[R]	1997[P]	Change (%)	1993[R]	1997[P]	Change (%)	1993[R]	1997[P]	Change (%)
Parcel, postal, courier services	616,839	865,661	40.3	18,892	24,677	30.6	13,151	18,512	40.8
Truck (for-hire, private, both)	4,822,222	5,518,716	14.4	6,385,915	7,992,437	25.2	869,536	1,094,924	25.9
Rail (includes truck and rail)	361,901	383,222	5.9	1,584,772	1,538,538	–2.9	980,236	1,050,517	7.2
Water[a]	197,370	195,461	–1.0	1,465,966	1,522,756	3.9	827,089	801,614	–3.1
Air (includes truck and air)	152,313	213,405	40.1	3,139	5,047	60.8	4,009	7,449	85.8
Pipeline[a]	340,664	330,176	–3.1	1,870,496	1,881,209	0.6	641,669	690,490	7.6
Other and unknown modes	283,106	447,908	58.2	706,690	753,848	6.7	233,216	266,732	14.4
BTS total (CFS + additional estimates)	**$6,774,414**	**$7,954,549**	**17.4**	**12,035,870**	**13,718,512**	**14.0**	**3,568,906**	**3,930,238**	**10.1**

[a]Preliminary Oak Ridge National Laboratory estimates prepared for the Bureau of Transportation Statistics, 1999.

KEY: P = preliminary; R = revised (includes modal estimates not shown separately).

SOURCES: U.S. Department of Commerce, Census Bureau, *1993 Commodity Flow Survey: United States,* TC92-CF-52 (Washington, DC: 1995).

____. *1997 Commodity Flow Survey: United States Preliminary,* EC97TCF-US(P) (Washington, DC: 1999).

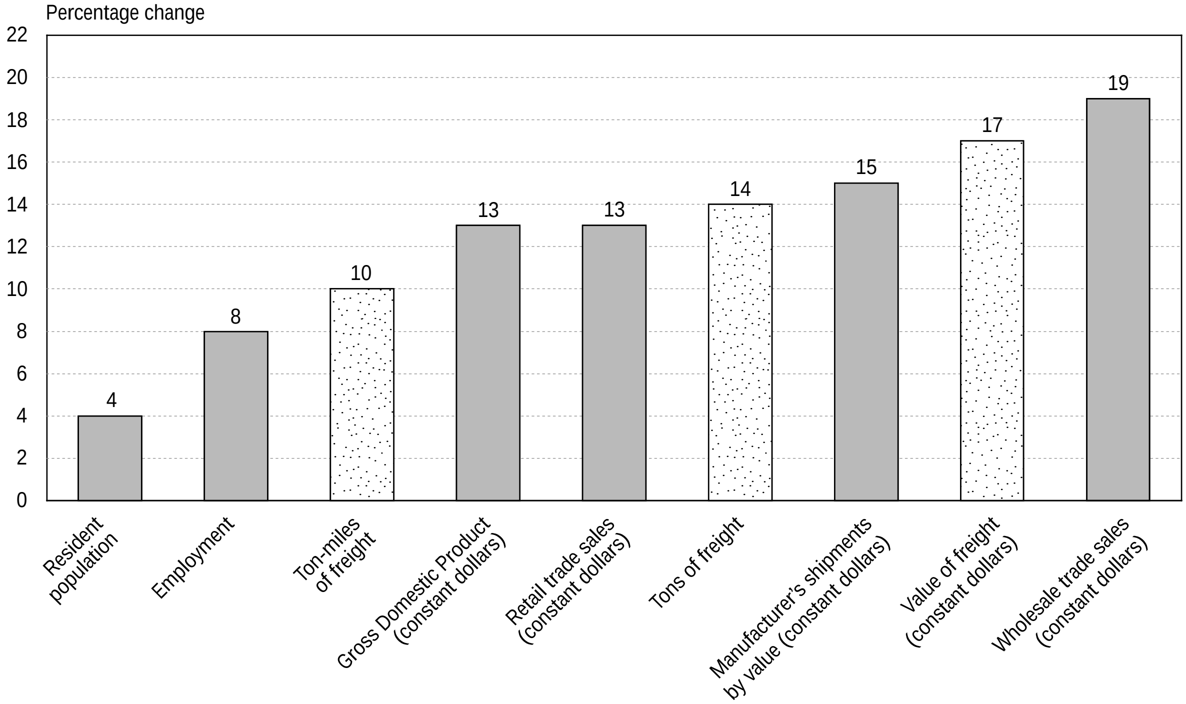
more than 40 percent by value of shipments and 31 percent by tons.

Sustained economic growth is a key factor that has affected the level of U.S. freight shipments since 1993. Expansion in international trade and increases in disposable personal income per capita also affected shipment levels. Between 1993 and 1997, U.S. Gross Domestic Product (GDP) grew about 13 percent in constant dollars compared with the 17 percent increase in the value of freight shipments. Sales by the manufacturing sector and the wholesale and retail trade sectors grew by 15, 19, and 13 percent, respectively, measured in constant dollars (see figure 2-3). Disposable personal income per capita increased from $20,490 to $21,970 in constant 1997 dollars, a 7 percent increase (USDOC 1998, table 722).

Changes in how and where goods are produced and increases in international trade have contributed to the rise in freight tonnage and ton-miles over the past few years. For example, the manufacture, assembly, and sale of a single product may involve several different facilities located hundreds or even thousands of miles apart.

Shifts in the U.S. economy toward more services and high-value, low-weight products are influencing the mix of commodities, even as overall shipments increase. Such shifts affect the average value by unit of weight of commodities shipped (e.g., personal computers have a much higher value per ton than lumber). On average, a ton of goods shipped in 1997 was valued at $580, a slight increase from $563 in 1993 (both in constant 1997 dollars).

Figure 2-3
Freight Shipments and Related Factors of Growth: 1993–97



SOURCES: Freight data based on: U.S. Department of Commerce, Census Bureau, *1993 Commodity Flow Survey: United States,* TC92-CF-52 (Washington, DC: 1993)

________. *1997 Commodity Flow Survey: United States Preliminary,* EC97TCF-US(P) (Washington, DC: 1999).

Preliminary Oak Ridge National Laboratory estimates prepared for the Bureau of Transportation Statistics, 1999.

Other data from U.S. Department of Commerce, Census Bureau, *Statistical Abstract of the United States: 1998* (Washington, DC: 1998).

How Freight Moves

Trucking (for-hire and private) moves more of the nation's freight, whether measured by value, tons, and ton-miles, than other modes (see table 2-5). In 1997, trucks transported $5.5 trillion of freight, a 14 percent increase from $4.8 trillion in 1993 (in constant 1997 dollars). Truck shipments accounted for 69 percent of the total value of shipments in 1997, about the same as in 1993. Measured by value of shipment, trucking was followed by parcel, postal, and courier services; rail; pipeline; and air (including truck and air) in 1997.

While the shipment value per ton increased slightly overall between 1993 and 1997, it decreased for trucking from $755 to $690 per ton (in constant 1997 dollars). The average reflects the wide range of commodities moved by truck—from sand and gravel, coal, and grain to electronic equipment and pharmaceuticals. Interestingly, the average value per ton of rail shipments (as a single mode) increased from $175 in 1993 to $210 in 1997.

Table 2-5
Modal Shares of Freight Shipments within the United States by Domestic Establishments: 1993 and 1997

Mode	Value (percent)		Tons (percent)		Ton miles (percent)	
	1993^R	1997^P	1993^R	1997^P	1993^R	1997^P
Truck (for-hire, private, both)	71.2	69.4	53.1	58.3	24.4	27.9
Rail (includes truck and rail)	5.3	4.8	13.2	11.2	27.5	26.7
Water	2.9	2.5	12.2	11.1	23.2	20.4
Pipeline	5.0	4.2	15.5	13.7	18.0	17.6
Parcel, postal, courier services	9.1	10.9	0.2	0.2	0.4	0.5
Air (includes truck and air)	2.2	2.7	0.0	0.0	0.1	0.2
Other and unknown modes	4.2	5.6	5.9	5.5	6.5	6.8
Total (domestic plus export shipments)	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

KEY: P = preliminary; R = revised.

SOURCES: U.S. Department of Transportation, Bureau of Transportation Statistics, based on U.S. Department of Commerce, Census Bureau, *1993 Commodity Flow Survey: United States,* TC92-CF-52 (Washington, DC: 1995).

____. *1997 Commodity Flow Survey: United States Preliminary,* EC97TCF-US(P) (Washington, DC: 1999).

Estimates for crude petroleum shipments by pipelines prepared for the Bureau of Transportation Statistics by Oak Ridge National Laboratory.

Local vs. Long-Haul Freight

Freight shipments can be categorized as local (less than 100 miles), intraregional (between 100 and 1,000 miles), and interregional (over 1,000 miles).[5] In 1997, local shipments constituted nearly 67 percent of the weight (7.7 billion tons), 40 percent of the value ($3 trillion), but only 9 percent of the ton-miles (254 billion) of all CFS shipments, about the same proportion of the value, tons, and ton-miles identified by the CFS in 1993, (see table 2-6).

Intraregional shipments in 1997 accounted for 45 percent of the value of goods shipments ($3.4 trillion), 29 percent of the tons (3.3 billion tons), and 62 percent of the ton-miles (1.7 trillion). Interregional shipments accounted for a relatively small proportion of the total CFS tonnage (4.4 percent in 1997), but they have had a large impact on the U.S. transportation system and the tonnage of such shipments has grown rapidly. In 1997, longer haul shipments accounted for 29 percent of the CFS ton-miles, about the same proportion as in 1993. Nevertheless, the tonnage moving such long distances grew about 40 percent, with value increasing nearly 30 percent in real terms.

Shipments of Major Commodities

Table 2-7 presents the relative shares of major commodities shipped by domestic establishments in 1997 as measured by the CFS. The commodities are based on the two-digit Standard Classification of Transported Goods (SCTG) coding system.[6] Because data on freight shipments in 1993 are not currently available in the

[5]Supplementary data are used to estimate total freight shipments in 1993 and 1997, but this supplementary data does not include freight movement for specific commodities, shipment sizes, and average length of haul per ton of shipments. Such changes can only be discussed using CFS data alone.

[6]BTS and the Census Bureau are retabulating the 1993 CFS data from the Standard Transportation Commodity Classification to the SCTG to make the data directly comparable. These data are expected to be available starting in fall 1999.

Table 2-6
U.S. Freight Shipments by Distance Shipped: 1993 and 1997
(Commodity Flow Survey data only)

	Value (constant $ billions)			Tons (millions)			Ton-miles (billions)		
Distance shipped	**1993**	**1997P**	**Change (%)**	**1993**	**1997P**	**Change (%)**	**1993**	**1997P**	**Change (%)**
Less than 100 miles	$2,527	$3,051	20.7	6,490	7,713	18.9	226	254	12.3
100–999 miles	2,981	3,420	14.8	2,833	3,337	17.8	1,492	1,743	16.8
1,000 miles or more	895	1,153	28.8	366	513	40.0	703	812	15.5
Total	**$6,402**	**$7,624**	**19.1**	**9,688**	**11,563**	**19.3**	**2,421**	**2,808**	**16.0**

KEY: P = preliminary.

SOURCES: U.S. Department of Commerce, Census Bureau, *1993 Commodity Flow Survey: United States,* TC92-CF-52 (Washington, DC: 1995).
____. *1997 Commodity Flow Survey: United States Preliminary*, EC97TCF-US(P) (Washington, DC: 1999).

Table 2-7
Major Commodities Shipped in the United States: 1997P
(Commodity Flow Survey data only)

Ranked by value: Commodity	Percent	Ranked by tons: Commodity	Percent	Ranked by ton-miles: Commodity	Percent
Electronic and other electrical equipment and components and office equipment	12.1	Gravel and crushed stone	16.0	Coal and coal products	18.5
Motorized and other vehicles (including parts)	7.8	Coal and coal products	10.8	Cereal grains	8.6
Textiles, leather, and articles of textiles or leather	7.2	Gasoline and aviation turbine fuel	7.8	Gasoline and aviation turbine fuel	5.0
Miscellaneous manufactured products	6.8	Nonmetallic mineral products	7.6	Other prepared foodstuffs and fats and oils	4.6
Mixed freight	5.9	Cereal grains	4.8	Base metal in primary or semifinished forms and in finished basic shapes	4.6
Machinery	5.9	Logs and other wood in the rough	4.3	Basic chemicals	4.2
Other prepared foodstuffs and fats and oils	4.6	Fuel oils	3.9	Gravel and crushed stone	3.6
Printed products	4.1	Natural sands	3.9	Wood products	3.6
Plastics and rubber	3.9	Coal and petroleum products, n.e.c.	3.8	Nonmetallic mineral products	3.4
Base metal in primary or semifinished forms and in finished basic shapes	3.8	Other prepared foodstuffs and fats and oils	3.5	Pulp, newsprint, paper, and paperboard	3.3

KEY: n.e.c. = not elsewhere classified; P = preliminary.

NOTE: Data exclude shipments of crude petroleum.

SOURCES: U.S. Department of Transportation, Bureau of Transportation Statistics, based on U.S. Department of Commerce, Census Bureau, *1993 Commodity Flow Survey: United States,* TC92-CF-52 (Washington, DC: 1995).
____. *1997 Commodity Flow Survey: United States Preliminary,* EC97TCF-US(P) (Washington, DC: 1999).

SCTG, this discussion of commodities covers shipments in 1997 only. Moreover, it must be remembered that the CFS does not cover several important commodities such as crude petroleum pipeline movements.

Merchandise in the category "electronic, other electrical equipment and components, and office equipment" accounted for the highest dollar value ($925 billion) of CFS shipments in 1997, followed by motorized and other vehicles (including parts); textiles, leather, and articles of textiles and leather; and miscellaneous manufactured products.

As for total tonnage shipped, the top commodity groups were gravel and crushed stone (1.8 billion tons), coal and coal products, gasoline and aviation fuel, and nonmetallic mineral products. Although gravel and crushed stone accounted for 16 percent of total CFS tons, shipments in this category accounted for less than 1 percent of the value and about 4 percent of the ton-miles of all shipments, impacting mostly local transportation.

The transportation of coal generated the most ton-miles (520 billion), followed by cereal grains, gasoline and aviation fuel, and prepared foodstuffs. Coal produced the most ton-miles because, unlike gravel and stone, which move mostly in local areas, coal is often shipped long distances; coal mined in Wyoming and Montana is transported nationwide. In 1997, a ton of coal was shipped 416 miles on average, compared with 55 miles for a ton of gravel and crushed stone.

Shipment Size

In analyzing CFS data, freight shipments were divided into several weight categories: less than 100 pounds, 100 to 999 pounds, 1,000 to 49,999 pounds, and over 50,000 pounds. In 1997, the value of CFS shipments under 100 pounds exceeded $1.1 trillion, 37 percent greater than in 1993 (in real terms) (see table 2-8). Growth in parcel, postal, and courier services and an increase in just-in-time production and distribution systems are partly responsible for this rise in smaller size shipments. Shipments of less than 100 pounds are often high-value, time-sensitive commodities transported by truck and air intermodal combinations, or by truck alone. In 1997, such small-size shipments accounted for 15 percent of the value of CFS shipments, little different from the 13 percent in 1993.

Large-size shipments (over 50,000 pounds) accounted for nearly 66 percent of the CFS ton-miles, 56 percent of tons shipped, but only 12 percent of the value of shipments in 1997. The relative share of large-size shipments fell slightly between 1993 and 1997 in value, tons, and ton-miles.

INTERNATIONAL FREIGHT

The importance of international trade to the U.S. economy can be seen in the increased value of U.S. merchandise trade[7] in recent decades. Between 1980 and 1997, the real-dollar value of U.S. merchandise trade more than tripled, from $496 billion to $1.7 trillion (in chained 1992 dollars). In addition, the ratio of the value of U.S. merchandise trade relative to U.S. GDP doubled from about 11 percent in 1980 to 23 percent in 1997 (USDOC ITA 1998).

During the past two decades, changes can be seen in the geography of trade. Trade with Asian Pacific countries grew greatly. In 1997, five Asian countries were among the top 10 U.S. trading partners, despite a slight downturn in trade in the second half of 1997 related to economic problems in the region (see table 2-9).

[7]Unless otherwise noted, the value of U.S. merchandise imports is based on U.S. general imports, customs value basis. Export value is f.a.s. (free alongside ship) and represents the value of exports at the port of exit, including the transaction price, inland freight, insurance, and other charges. Generally, data for imports that are valued at less than $1,250 and exports that are valued at less than $2,500 are excluded.

Table 2-8
Shipments by Size: 1993 and 1997
(Commodity Flow Survey data only)

	Value (constant $ billions)			Tons (millions)			Ton-miles (billions)		
Shipment size	1993	1997P	Change (%)	1993	1997P	Change (%)	1993	1997P	Change (%)
Less than 100 pounds	852	1,165	36.6	35	41	17.8	12	15	26.4
100–999 pounds	995	1,215	22.1	139	168	20.1	30	41	37.6
1,000–49,999 pounds	3,735	4,360	16.7	3,830	4,877	27.4	728	903	24.1
Over 50,000 pounds	820	885	7.9	5,685	6,477	13.9	1,651	1,849	12.0

KEY: P = preliminary.

SOURCES: U.S. Department of Transportation, Bureau of Transportation Statistics, based on U.S. Department of Commerce, Census Bureau, *1993 Commodity Flow Survey: United States,* TC92-CF-52 (Washington, DC: 1995).

____. 1997 *Commodity Flow Survey: United States Preliminary,* EC97TCF-US(P) (Washington, DC: 1999).

Table 2-9
Top 10 U.S. Merchandise Trade Partners by Value: 1980 and 1997 (chained 1997 dollars)

1980					1997				
Rank	Country	Imports	Exports	Total	Rank	Country	Imports	Exports	Total
1	Canada	77,240	65,942	143,182	1	Canada	168,201	151,767	319,968
2	Japan	57,221	38,732	95,954	2	Japan	121,663	65,549	187,212
3	Mexico	23,437	28,216	51,653	3	Mexico	85,938	71,388	157,326
4	West Germany	21,784	20,419	42,203	4	China	62,558	12,862	75,420
5	United Kingdom	18,336	23,649	41,985	5	United Kingdom	32,659	36,425	69,084
6	Saudi Arabia	23,564	10,746	34,310	6	Germany	43,122	24,458	67,580
7	France	9,809	13,945	23,754	7	Taiwan	32,629	20,366	52,995
8	Taiwan	12,769	8,080	20,849	8	South Korea	23,173	25,046	48,219
9	Netherlands	3,564	16,151	19,715	9	Singapore	20,075	17,696	37,771
10	Venezuela	9,913	8,520	18,433	10	France	20,636	15,965	36,601

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, January 1999, based on data from U.S. Department of Commerce, Census Bureau, *Statistical Abstract of the United States* (Washington, DC: Various years).

These five countries accounted for 26 percent of overall U.S. trade in 1997, up from 17 percent in 1980. Canada and Mexico were the first and third largest U.S. trading partners in 1980 and in 1997. While the rankings remained the same, the U.S. trade relationship with these two countries deepened. In 1980, Canada and Mexico together accounted for 22 percent of all U.S. trade by value. By 1997, this had increased to over 30 percent (USDOC 1985; USDOC Census FTD 1997).

Changes over the past two decades also occurred in the commodities traded. Higher value manufactured goods now dominate U.S. trade, accounting for $1.3 trillion or 85 percent of the value of all merchandise trade in 1997. Of these goods, motor vehicles, computers, telecommunications equipment, and aircraft are among the top U.S. import and export commodities by value. While the value of manufactured goods increased as a share of U.S. trade, the share of agricultural commodities declined from 13 percent in 1980 to 6 percent in 1997. Mineral fuels accounted for approximately 6 percent of the value of U.S. trade in 1997, primarily imports of crude petroleum and petroleum products (USDOC ITA 1999).

The relative roles of transportation modes in carrying U.S. international trade have changed in recent decades, especially in terms of value. Due to the way in which data on U.S. trade are collected, it is not possible to fully calculate the role of intermodal or multimodal moves of international freight. Modal shares, therefore, represent single modes in use at a U.S. port of entry or exit. In 1997, water was the predominant mode in both value and tonnage, while air accounted for nearly 28 percent of the value but only a small part of the tonnage (see figure 2-4). Truck and rail accounted for smaller, but still important shares.[8]

Waterborne Trade

While waterborne trade accounted for more than three-quarters of the tonnage of U.S. international trade in 1997, its share of the value of U.S. trade declined from 62 percent in 1980 to 40 percent in 1997[9] (USDOC Census 1994, table 1062; USDOC Census FTD 1997). Among the factors that explain this decline are greater land trade with Canada and Mexico and the demand for faster delivery of high-value commodities, which has increased air trade.

In 1997, maritime ports on the west coast of the United States accounted for 42 percent of the value of U.S. waterborne trade with other countries compared with only 24 percent in 1980. East coast ports' share by value, however, declined from 41 percent to 38 percent over this period (remaining relatively stable in the last 5 years), and the share of value for Gulf ports also dropped from 33 percent to 18 percent (USDOC Census 1997, table 1069; USDOT MARAD 1998). Increased trade with Asian Pacific countries between 1980 and 1997 helps explain this east to west coast shift. The financial crisis impacting several Asian economies, beginning in the second half of 1997,[10] caused a slight decrease in overall merchandise trade by west coast ports. Between 1996 and 1997, the value of total international trade by west coast ports decreased 1.5 percent compared with a 0.4 percent decrease for east coast ports. Because of the appreciation of the U.S. dollar in relation to several Asian currencies, imports through west coast ports increased 3 percent between 1996 and 1997, while exports declined 12 percent.

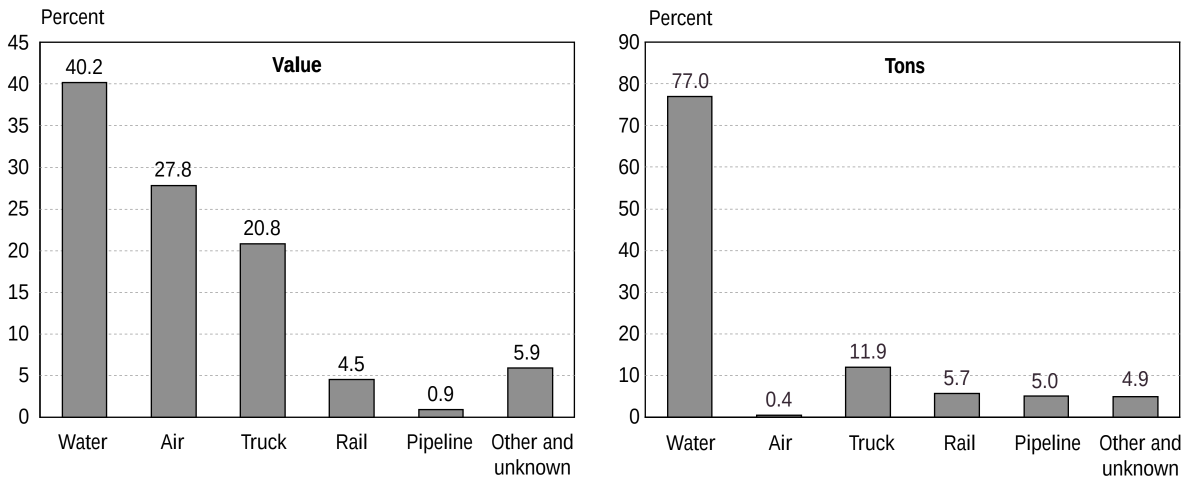
The ports of Long Beach and Los Angeles account for the majority of west coast waterborne trade. Long Beach is also the leading U.S. port both by value and for containerized trade, as measured by the number of 20-foot equivalent units (TEUs) handled. In 1997, $85 billion worth of international trade passed through the

[8]BTS estimated the weight of U.S. land exports. (For water and air, see USDOC Census FTD 1997. Truck, rail, pipeline, and other and unknown are from BTS analyses and Transborder Surface Freight Data.)

[9]Excludes waterborne in-transit shipments. In-transit shipments are merchandise shipped through the United States in transit from one foreign country to another.

[10]The causes of the Asian financial crisis are complex and multifaceted. However, a precipitating event occurred in July 1997 when the government of Thailand abandoned its efforts to maintain a fixed exchange rate for its currency, the baht. The baht quickly depreciated by more than 20 percent. Within a few days, most neighboring countries had also abandoned their fixed exchange rates. Currency crises often have destabilizing effects on international trade. U.S. overall trade with several Asian economies decreased in 1997, while the U.S. trade deficit with several Asian countries increased. (For further information, see USITC 1998.)

Figure 2-4
Modal Shares of U.S. Merchandise Trade by Value and Tons: 1997



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, January 1999, except water and air data from U.S. Department of Commerce, Census Bureau, Foreign Trade Division.

port of Long Beach, and the port handled 2.7 million TEUs (see table 2-10). Other west coast ports such as Los Angeles, Seattle, and Tacoma are also important gateways for U.S. trade with Asia.[11] The port of New York/New Jersey is the east coast leader in both the value of trade ($68 billion) and in the number of containers (1.7 million TEUs) handled in 1997. Charleston and Norfolk are also major east coast container ports. The importance of Gulf ports (e.g., Houston and South Louisiana) in the trade of bulk commodities and crude petroleum can be seen from their listing as the top two U.S. ports by tonnage.

Air Freight

Air freight moves both by all-cargo carriers and carriers that transport passengers. Between 1980 and 1997, air freight's share of the value of U.S. international merchandise trade increased from 16 percent to nearly 28 percent. Commodities that move by air tend to be high in value; air's share of U.S. trade by weight was less than 1 percent in 1997.

Western European and Asian Pacific countries dominate air freight to and from the United States. The top three countries by value of air freight with the United States are Japan, the United Kingdom, and Singapore. New York's John F. Kennedy (JFK) International Airport was the leading gateway for shipments into and out of the United States by all modes, accounting for over $89 billion in 1997. Following JFK were the airports of Chicago, Los Angeles, and San Francisco.[12]

North American Merchandise Trade

U.S. merchandise trade with Canada and Mexico represents 30 percent of all U.S. international trade, with Canada accounting for approximately 20 percent and Mexico 10 percent. U.S. trade with Mexico has grown more quickly than with Canada, and in 1997 Mexico surpassed Japan as the second largest market for U.S. mer-

[11] Many individual west coast ports were also impacted by the Asian financial crisis. The overall value of the port of Long Beach's international trade declined 2 percent between 1996 and 1997. The decline in Long Beach's export trade was more dramatic, 18 percent. The ports of Seattle and Oakland also saw notable decreases in export traffic between 1996 and 1997.

[12] San Francisco includes the San Francisco International Airport and other smaller regional airports. Chicago includes O'Hare, Midway, and other smaller regional airports.

Table 2-10
Top Water Ports for International Trade: 1997

By 20 foot equivalent units (TEUs)

Rank	Port name	TEUs
1	Long Beach, CA	2,673,199
2	Los Angeles, CA	2,084,924
3	New York,NY/NJ	1,738,391
4	Charleston, SC	955,488
5	Seattle, WA	953,304
6	Oakland, CA	843,066
7	Norfolk, VA	769,718
8	Miami, FL	623,658
9	Houston, TX	609,451
10	Tacoma, WA	551,164

By value (billions of current U.S. dollars)

Rank	Port name	Value
1	Long Beach, CA	85.3
2	Los Angeles, CA	73.4
3	New York, NY and NJ	68.0
4	Houston, TX	37.1
5	Seattle, WA	33.6
6	Charleston, SC	27.3
7	Oakland, CA	25.4
8	Norfolk, VA	25.0
9	Tacoma, WA	19.6
10	Baltimore, MD	18.8

By tonnage (millions of U.S. short tons)

Rank	Port name	Tonnage
1	Houston, TX	102.8
2	South Louisiana, LA	76.8
3	Corpus Christi, TX	62.2
4	New York, NY and NJ	56.7
5	New Orleans, LA	52.4
6	Baton Rouge, LA	38.4
7	Long Beach, CA	38.4
8	Texas City, TX	37.4
9	Norfolk, VA	35.4
10	Beaumont, TX	33.6

NOTES: Value data do not include in-transit shipments. Tonnage data, unlike port tonnage data for previous years, do not include in-transit shipments.

SOURCES: TEU data: U.S. Department of Transportation, Maritime Administration, Office of Statistical and Economic Policy, based on data from the *Journal of Commerce,* Port Import and Export Reporting System (PIERS).
Value data: U.S. Department of Transportation, Maritime Administration, Office of Statistical and Economic Policy, Annual Waterborne Databanks 1996, 1998.
Tonnage data: U.S. Army Corps of Engineers, Navigation Data Center, special tabulation, December 1998.

chandise exports (although Mexico remained the third largest trading partner overall). Between 1993 and 1997, trade with North American Free Trade Agreement (NAFTA)[13] partners increased 62 percent in current dollars, from $293 billion to $475 billion. During this same period, U.S. trade with Mexico grew most rapidly, almost doubling from $81 billion in 1993 to $157 billion in 1997 (USDOC 1998, table 1323; USDOC Census FTD 1997).

In terms of commodities, motor vehicles and motor vehicle parts and accessories dominate trade between all of the North American countries. Other leading North American trade commodities include consumer electronics, telecommunications equipment, and aircraft equipment and parts. In addition, crude petroleum, natural gas, and petroleum products are important U.S. imports from both Canada and Mexico. Mexico is also a chief source of U.S. imports of clothing and textiles, while paper products, furniture, and wood products are among leading U.S. imports from Canada.

Truck trade represented almost 70 percent of the value and 33 percent of the tonnage of overall NAFTA merchandise trade in 1997.[14] Rail's share was approximately 15 percent both by value and weight. Rail played a greater role in U.S.-Canadian trade than in U.S.-Mexican freight movement. Ten states accounted for approximately two-thirds of the value of North American land trade in 1997.[15] These were Michigan, Texas, California, New York, Ohio, Illinois, Pennsylvania, Indiana, North Carolina, and Tennessee. Many of these states contain major population and manufacturing centers.

[13]The United States, Canada, and Mexico signed the agreement in December 1993 and the treaty entered into force on January 1, 1994.
[14]BTS estimate.
[15]Top origin and destination states are based on U.S. international trade data collected from administrative records. Due to filing requirements and procedures, border state activity may be overrepresented. In addition, trade data do not always reflect physical transportation flows. The location is often misrepresented because trade documents are not always filed where shipments physically cross the border.

On the U.S.-Canadian border, 10 gateways accounted for approximately 83 percent of freight moved by trade, while for U.S.-Mexican trade, the top 10 land gateways account for 93 percent. The three largest gateways for U.S.-Canadian land trade were Detroit, Buffalo-Niagara Falls, and Port Huron (see figure 2-5). On the U.S.-Mexican border, the top gateway was Laredo, followed by El Paso, and Otay Mesa, California. Truck traffic accounted for the majority of the trade at most of these gateways. Port Huron, Michigan, and Eagle Pass, Texas, were important rail gateways. For many of these gateways, the shipment origins and destinations were outside the state in which the gateway is located. For example, nearly four-fifths of the shipments that crossed the border at Laredo had their origins or destinations outside of Texas. Three-quarters of the shipments that crossed the border at Buffalo have their origins or destinations outside of New York (USDOT BTS 1998b).

Although much North American trade takes place between bordering states or provinces such as Ontario and Michigan and Texas and Chihuahua, other trade flows are characterized by longer distances (e.g., truck shipments between California or Texas and Ontario for U.S.-Canadian trade and between Texas and Jalisco and Michigan and the Mexico City metropolitan area for U.S.-Mexican trade). Shipments from maquiladora[16] plants and facilities along the U.S.-Mexican border accounted for some of the shorter flows in U.S.-Mexican trade, while some of the longer flows were between motor vehicle manufacturing and production centers at diverse locations in Mexico, the United States, and Canada.

[16]Maquiladoras are manufacturing or assembly plants located in Mexico that provide parts, components, and additional processing for manufactured products produced by U.S. or multinational companies. Maquiladora plants located near the U.S. border are often wholly owned or are a subsidiary of a U.S. or multinational company.

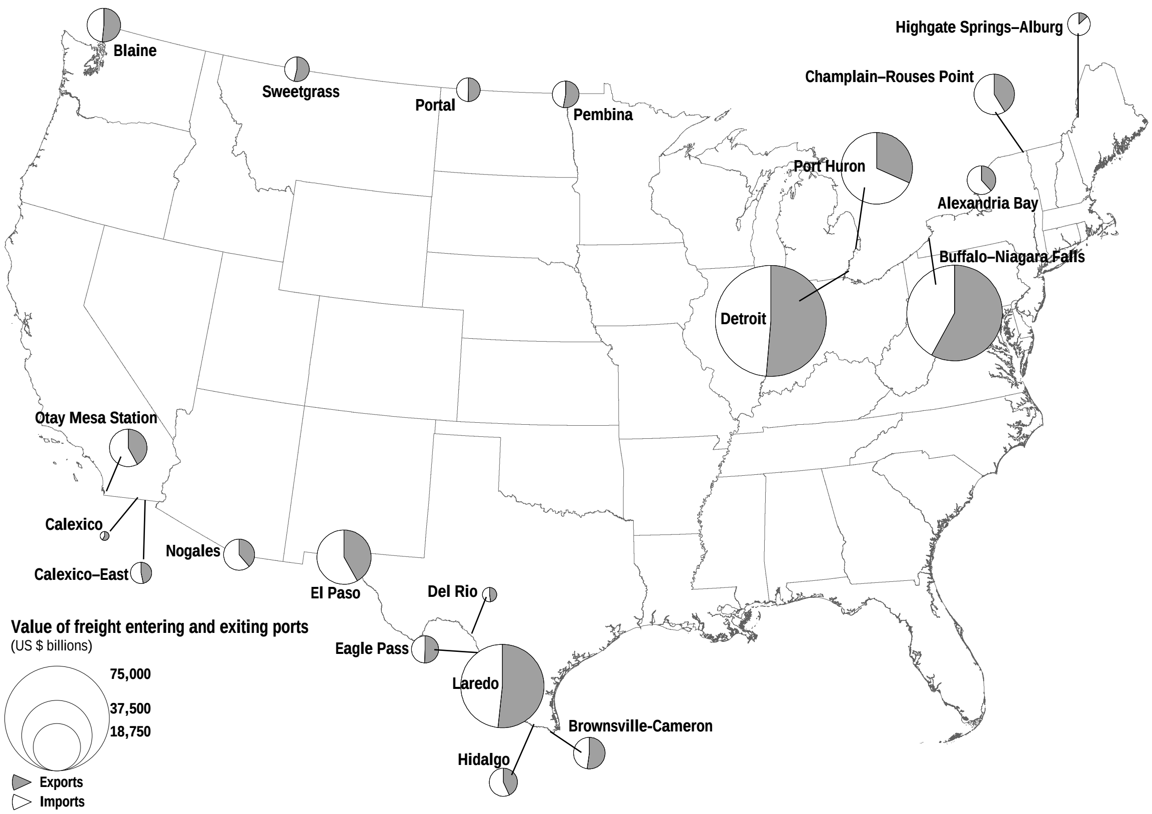
A Multimodal View

Air, land, and water modes are all important in transporting goods in U.S. international trade. Figure 2-6 illustrates the top ports of entry and exit for U.S. international trade shipments by value in 1997. The leading gateway overall in 1997 was JFK International Airport in New York with $89 billion of activity. This was followed by the water port of Long Beach, California, which handled $85 billion worth of shipments, and Detroit, Michigan, a land gateway with $83 billion worth of shipments in 1997. Changes in the mix of commodities traded internationally, geographic shifts in centers of production, global trade patterns, and many other factors will continue to affect these gateways as well as the movement of international trade shipments to, from, and within the United States.

USE AND PERFORMANCE

Many factors affect the performance of the transportation system: accessibility, safety, environmental restraints, input costs, energy efficiency, capacity-to-demand ratios, reliability, travel time and delay, goods damage, and a host of other variables. Safety, energy efficiency, environmental impacts, and economic measures of the system's performance are discussed elsewhere in this report. The following section focuses on trends in the use of the transportation system and how well the transportation system delivers services that people and businesses want, such as speed, reliability, security, convenience, and comfort, when they buy a passenger ticket, forward a shipment, or travel during peak hours. Thus, the discussion of performance that follows highlights such indicators as: 1) on-time performance, congestion, and delay; 2) the security of goods during shipment against damage or loss; 3) productivity; and 4) accessibility of transit services to persons with physical disabilities. In

Figure 2-5
Top Border Land Ports: 1997



NOTES: Data include transshipments between the United States and Mexico. Trade levels reflect the mode of transportation as a shipment entered or exited a U.S. Customs port. Alaska is not shown as its border land ports do not fit the criteria for inclusion in this figure.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Transborder Surface Freight Data, 1998.

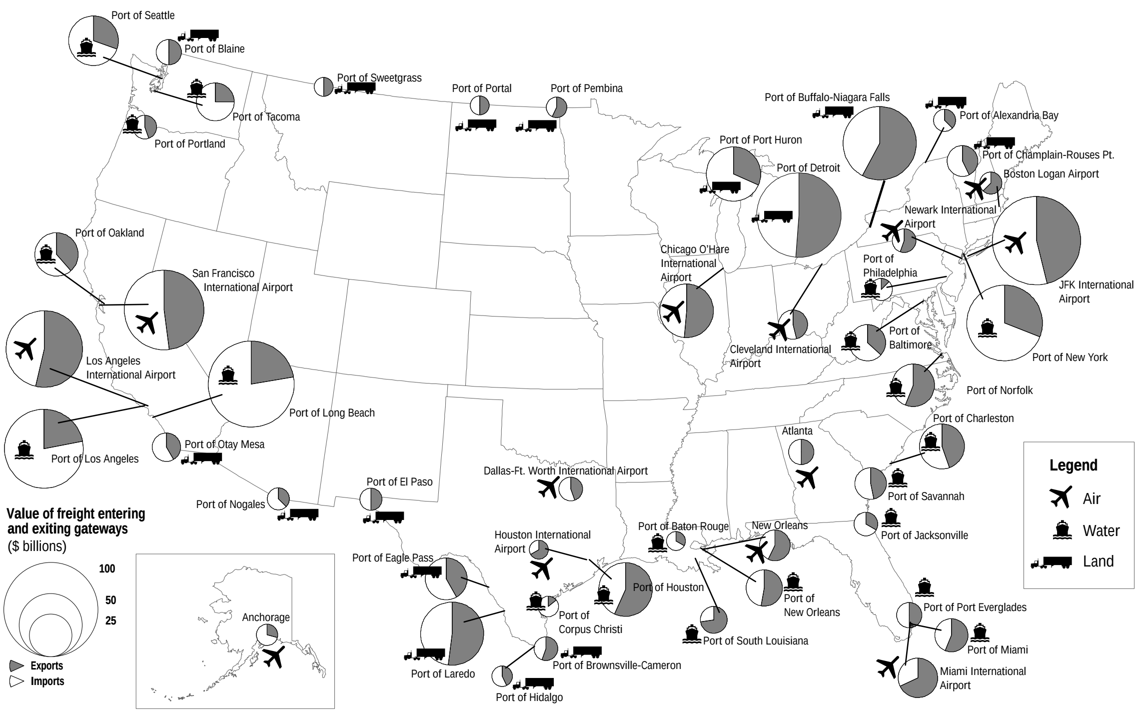
addition, selected operational efficiency indicators will be discussed for some modes.

Highway

Vehicle-miles traveled (vmt) on public roads increased 68 percent between 1980 and 1997, with urban vmt growth outpacing rural vmt—83 percent to 49 percent. Some of the growth in urban areas is due to the expansion of urban boundaries and urban population (USDOT FHWA various years) (see table 2-11). Urban Interstate travel increased the most over these years, about 4.9 percent annually, although other urban arterials still carried the most traffic in 1997.

For the highway user, traffic congestion and delay are measures of highway performance. Unfortunately, direct measures are not now available to determine whether congestion and delay are getting better or worse for the nation as a whole. Two indirect methods are used, however: 1) congestion and delay calculations based on daily volume-to-capacity ratios such as those found in the Federal Highway Administration's (FHWA's) Highway Performance Monitoring System (HPMS); and 2) trip speed estimates based on commuter trip length and travel time data collected from travel surveys.

Figure 2-6
Top Freight Gateways by Shipment Value: 1997



NOTES: Air—Values for some airports may include a low level (generally less than 2 percent of the total value) of small user-fee airports located in the same regional area. In addition, due to the Census Bureau's confidentiality regulations, data for nearby individual courier operations (e.g., DHL, Federal Express, United Parcel Service) are included in the airport totals for New York Kennedy, New Orleans, Los Angeles, Cleveland, Chicago O'Hare, Miami, and Anchorage. Land—Data include transshipments between the United States and Mexico. Trade levels reflect the mode of transportation as a shipment entered or exited a U.S. Customs port. Includes truck, rail, pipeline, and other modes of land transportation.

SOURCES: Air—U.S. Department of Commerce, Census Bureau, Foreign Trade Division, special tabulation. Maritime and Great Lakes—U.S. Department of Transportation, Maritime Administration, Office of Statistical and Economic Policy, *U.S. Waterborne Exports and General Imports, Annual 1997* (Washington, DC: 1998). Land—U.S. Department of Transportation, Bureau of Transportation Statistics, Transborder Surface Freight Data, 1998.

Two estimates of congestion using volume-to-capacity ratios are discussed here: the Texas Transportation Institute's (TTI's) studies of urban congestion and FHWA's estimates of volume-to-service-flow (where service flow is a measure of capacity). In addition, results from various Nationwide Personal Transportation Surveys augment these estimates. As shown below, the congestion indicators developed by these indirect methods often produce conflicting views about traffic congestion and/or delay.

TTI's most recent analysis of urban highway congestion shows highway congestion and traffic delay rising in the United States.[17] Of the 70 urban areas included in the TTI study, the estimated level of congestion declined in only 2—Phoenix and Houston—between 1982 and 1996. Congestion in most other urban areas increased, dramatically in some instances. The number of urban areas in the study experiencing unacceptable congestion rose from 10 of the 70 in 1982 to 39 in 1996, with the average roadway congestion index—measured by travel volume per road lane—rising about 25 percent from 0.91 to 1.14. TTI selected an index of 1.00 or greater as the threshold for unacceptable congestion (see figure 2-7).

[17] The primary data source used by TTI is the HPMS.

Table 2-11
Highway Vehicle-Miles Traveled by Functional Class: 1980–97 (millions)

	1980	1997	Percentage change
Urban			
Interstate	161,242	351,371	124.1
Other arterials	484,189	846,596	74.8
Collectors	83,043	130,461	57.1
Local	126,791	222,024	75.1
Total	**855,265**	**1,560,452**	**82.5**
Rural			
Interstate	135,084	240,121	77.8
Other arterials	262,774	391,481	49.0
Collectors	189,468	253,807	34.0
Local	84,704	114,511	35.2
Total	**672,030**	**999,920**	**48.8**
Total	**1,527,295**	**2,560,372**	**67.6**

SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: Various years).

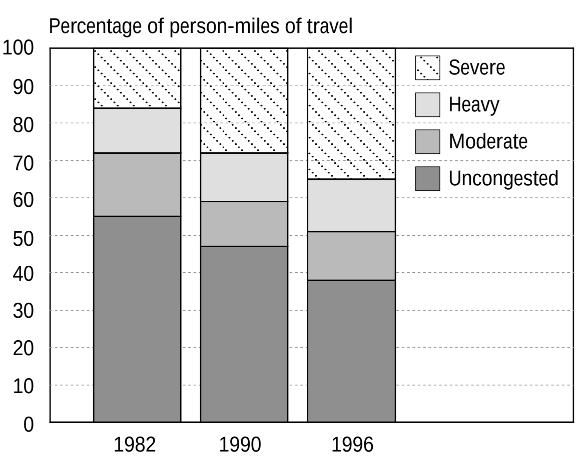
Table 2-12 presents an index of roadway congestion, annual delay, and wasted fuel. In 1996, drivers in the 70 study areas experienced an average of 40 hours of delay each over the course of the year—the equivalent of a full work week. This was 8 percent more delay than in 1990, and 150 percent more than in 1982 when the average was 16 hours. In 1982, peak-hour travel took 13 percent more time than travel in less congested conditions (for the same distance traveled). By 1996, peak period travel required 25 percent more travel time on average, and in some cities it took nearly 50 percent more time than offpeak travel (TTI 1998).

TTI estimated that the total annual costs of congestion in the 70 areas reached $74 billion in 1996, $65 billion due to delay (productivity loss) and $9 billion due to wasted fuel. Costs ranged from $333 per driver in smaller cities to $936 in large cities, averaging about $629 overall. The study estimated that 6.7 billion gallons of fuel was wasted in these areas due to traffic congestion, compared with about 2.7 billion gallons in 1982 (TTI 1998).

FHWA's volume-to-capacity estimates only partly confirm TTI's findings, though changes in the definition of congestion in 1995 make a full comparison difficult. Moreover, FHWA's data only measure recurring congestion, which occurs during normal daily operations because demand exceeds capacity, while TTI's data also measure nonrecurring congestion, which occurs as a result of traffic crashes, breakdowns, or other irregular incidents. FHWA's 1995 through 1997 estimates show slight increases in congestion for principal arterials (i.e., arterials other than Interstates, freeways, and expressways). Urban Interstates, on the other hand, show a reduction in delay over the period. Similarly, urban freeways and expressways show a decrease since 1995. Rural roads show no noticeable increase (USDOT FHWA Various years, table HM-61).

Commuter speeds, as measured by the NPTS in 1983 and 1995, show a 20 percent increase from 28 mph to 34 mph (USDOT FHWA 1997c, 13). At first glance, the NPTS data might seem to contradict the TTI findings. There

Figure 2-7
Congested Person-Miles of Travel in 70 Urban Areas



SOURCE: Texas Transportation Institute, *Urban Roadway Congestion Annual Report: 1998* (College Station, TX: 1998), p. 35.

Table 2-12
Urban Congestion Indicators for 70 Urban Areas: Selected Years

Year	Average roadway congestion index	Annual delay per eligible driver (person-hours)	Wasted fuel per eligible driver (gallons)	Annual fuel wasted per urban area (million gallons)
1982	0.91	16	23	39
1986	1.01	22	32	54
1990	1.07	27	39	68
1992	1.09	30	44	76
1994	1.11	35	51	84
1995	1.12	37	54	91
1996	1.14	40	58	96

SOURCE: Texas Transportation Institute, *Urban Roadway Congestion Annual Report: 1998* (College Station, TX: 1998), pp. 11–21.

are several plausible reasons for different findings, however. First, TTI only includes urban areas, while the NPTS also includes non-urban areas, where congestion is typically less severe or nonexistent. Second, the NPTS data include commuting by all modes, while TTI only includes highway modes of travel. Thus, the NPTS results reflect commuter decisions in the 1980s and 1990s to switch from car pools and transit to single-occupant vehicle trips, which often save time for the individual workers, but increase road congestion. Other reasons commute speeds may have increased are metropolitan decentralization (people have moved to places where speeds are higher) and the widening of the peak period because of work-time flexibility (USDOT FHWA 1997c).

In 1995, the NPTS for the first time included customer satisfaction questions that are helpful in judging how well the transportation system meets people's expectations. Nearly half of respondents said that congestion was no problem at all, with about one-third saying it was a small problem and 20 percent saying it was a large problem. About one-quarter of people in urban and suburban areas reported that congestion was a large problem, whereas 37 percent of suburban residents and 29 percent of urban residents reported it as a small problem. Rural respondents report the least problem with congestion and town and second-city[18] residents fall somewhere in between. A question was also asked about pavement quality on major highways. One-quarter of respondents reported that it is a large problem, and another 39 percent said it is a small problem. About 15 percent of respondents reported that poor walkways or sidewalks were a large problem in their community; another 28 percent reported it as a small problem; the remaining 57 percent reported it was no problem (USDOT FHWA 1999a).

Air

Enplanements (both domestic and international) increased from 302 million in 1980 to 575 million in 1997 (USDOT BTS 1998a). The change in enplanements at major hubs can be seen in figure 2-8. Revenue passenger-miles increased from 268 billion miles in 1980 to 622 billion miles in 1997 (USDOT BTS In press).

Several measures are available to examine the performance of commercial air travel. These include on-time information, speed, and baggage and boarding problems.

[18] For the definition of second cities, see footnote 3.

Figure 2-8
Enplanements at Major Hubs: 1987 and 1997

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, *Airport Activity Statistics of Certificated Air Carriers: Summary Tables; Twelve Months Ending December 31,1997* (Washington, DC: 1997).

In 1997, 78 percent of major carrier flights arrived on time.[19] Although arrival on-time performance in 1997 was slightly lower than other years during the past decade, it was the first year since 1991 that it improved (USDOT Various years).

Throughout the 1990s, aircraft speed of scheduled large certificated air carrier flights (not including small certificated and commuter airlines) averaged just under 220 mph. Average speed is measured as the ratio of flight length to flight duration. Flight length is measured from airport to airport and does not include any additional mileage due to flight deviations (e.g., going around bad weather or circling because of airport airspace congestion). Flight duration is measured from departure gate to arrival gate. Thus, this metric measures overall trip speed rather than air-over-ground speed.

Both mishandled baggage and complaint rates were lower in 1997 than they were in 1990, although complaints edged up in 1996 and 1997. Mishandled baggage per 1,000 enplanements was 4.96 in 1997, compared with 6.73 in 1990. Approximately 2.3 million claims were filed in 1997 (USDOT BTS 1998, tables 1-44–1-46).

The number of consumer complaints against major air carriers received by the U.S. Department of Transportation increased in 1997 for the second year in a row after several years of decline. In 1997, 86 out of every 1 million persons enplaned on a major airline registered a complaint with DOT, the highest rate since 1993 (USDOT Various issues).

[19] An aircraft departure or arrival is considered on-time if it takes place within 15 minutes of its scheduled time.

The percentage of passengers denied boarding (i.e., "bumped" from flights because seats were oversold by the airline) on the 10 largest U.S. air carriers has risen appreciably since 1993, from 683,000 to 1.1 million passengers in 1997 (from 0.15 percent to 0.21 percent of boardings). Voluntary denials[20] made up 95 percent of all denials in 1997 and is where virtually all the increase has been concentrated (USDOT Various years).

Water

In 1997, 2.3 billion tons of cargo were moved by water, with just over half of it foreign trade. Since 1988, foreign trade tonnage has increased by 25 percent while domestic freight moved by water remained about the same at around 1.1 billion tons. In 1997, 57 percent of domestic tons moved on the inland waterways, 24 percent moved coastwise, and 11 percent moved lakewise (the rest was local and intraterritorial traffic). Lakewise and inland waterway movement increased by 13 percent and 7 percent, respectively, over this period, while coastwise movement declined by 19 percent (USACE 1998).

Port performance is typically measured by annual cargo throughput. In 1997, 150 ports handled more than 1 million tons of cargo, and 31 ports handled over 10 million tons (see figure 2-9).

The U.S. Army Corps of Engineers provides data on lock performance, including average processing time, lock closure, and lock traffic, for each lock chamber of the inland waterway system in its Performance Monitoring System (USACE 1999), but no national summary is currently available.

Transit

Transit ridership, which is concentrated in a few large metropolitan areas (see figure 2-10), remained constant between 1987 and 1997 with unlinked trips going from 7.85 million trips in 1987 to 7.98 million in 1997, while miles traveled increased from about 36 billion to 40 billion. Although bus and heavy-rail ridership stagnated during this period, it still carried the majority of transit users (see table 2-13). Ridership on other modes of transit—especially demand responsive service,[21] light rail, and ferries—markedly increased.

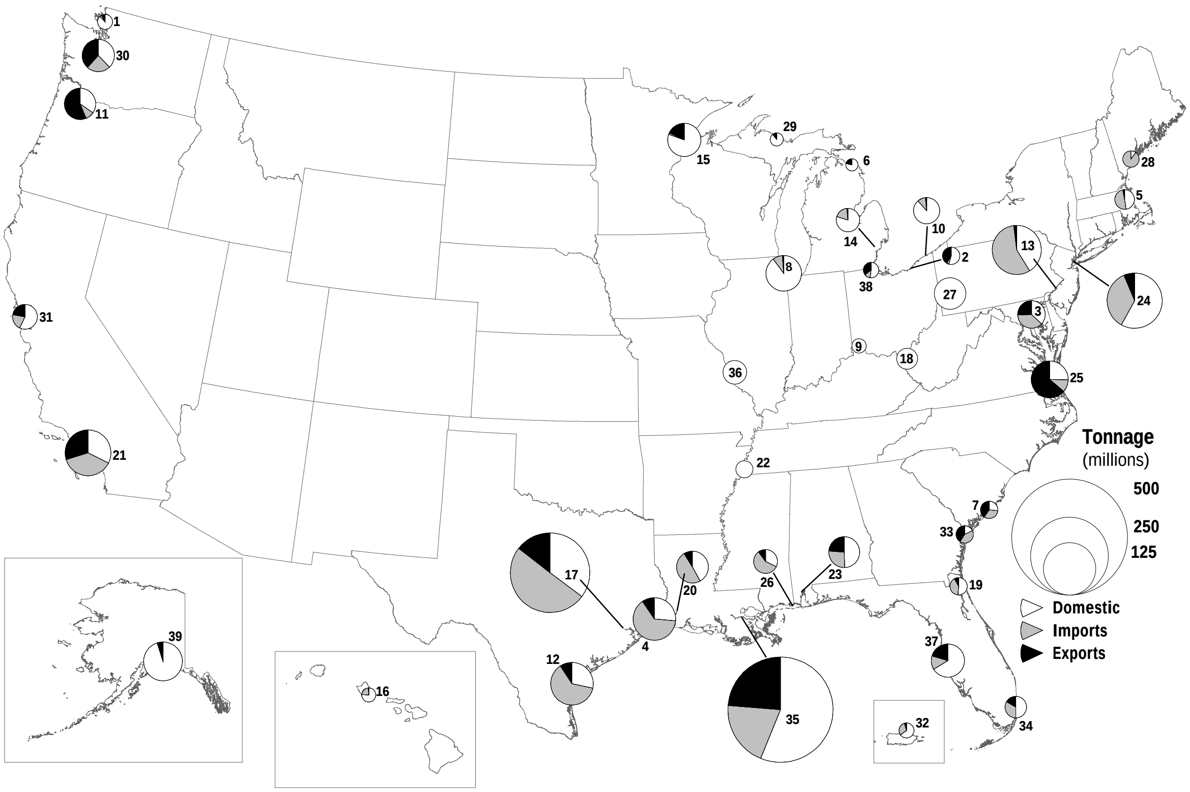
The performance of transit service in the United States seems to be improving, at least for federally subsidized transit for which data are available. Vehicle revenue-miles measure the availability of transit service. From 1987 to 1997, total revenue-miles increased 25 percent from 2.28 billion miles to 2.85 billion miles. Demand responsive transit revenue-miles tripled from 113 million to 350 million. Rail service also increased, with light-rail revenue-miles more than doubling, commuter rail up 35 percent, and heavy rail up 14 percent (see table 2-13). Bus revenue-miles increased only 8 percent but still accounted for 56 percent of all vehicle revenue-miles. In general, increases in vehicle revenue-mileage are due to expansion in the geographic coverage for transit, not increased frequency of existing services (USDOT FTA 1999).

The percentage of transit vehicles providing accessible service under the Americans with Disabilities Act (ADA) varied dramatically by type of transit, but was generally higher in 1997 than in 1993. About 68 percent of buses were ADA accessible in 1997, up from 53 percent in 1993. Only 29 percent of commuter rail vehicles were accessible in 1997, but this was higher than the 18 percent in 1993. A relatively large percentage of heavy-rail vehicles are ADA accessi-

[20] In this type of denial, a customer voluntarily gives up his/her reserved seat on an overbooked flight, usually in return for some form of compensation from the airline.

[21] Demand responsive service includes passenger cars, vans, or buses with fewer than 25 seats operating in response to calls from passengers or their agents rather than on fixed routes. These include paratransit and dial-a-ride services, but exclude jitneys and other fixed-route services.

Figure 2-9
Tonnage Handled by Major Water Ports: 1997

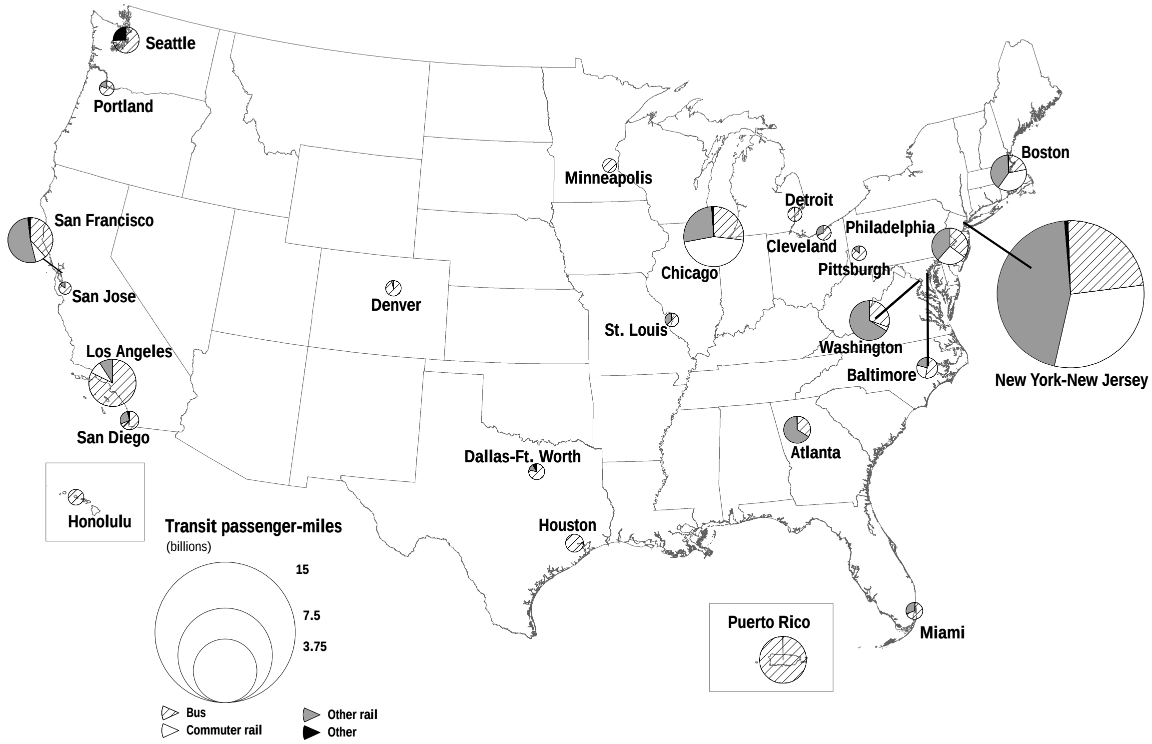


NOTE: Major ports were defined as having one port with over 10 million tons shipped in 1997, and were combined with other ports in the same major waterway or located in the same metropolitan statistical area with at least 1 million tons shipped.

SOURCE: U.S. Army Corps of Engineers, Water Resources Support Center, Navigation Data Center, Alexandria, VA.

1 Anacortes, WA
2 Ashtabula
Ashtabula, OH
Conneaut, OH
3 Baltimore, MD
4 Beaumont-Port Arthur
Beaumont, TX
Port Arthur, TX
5 Boston
Boston, MA
Salem, MA
6 Calcite, MI
7 Charleston, SC
8 Chicago-Gary
Chicago, IL
Gary, IN
Indiana Harbor, IN
Burns Waterway Harbor, IN
Buffington, IN
9 Cincinnati, OH
10 Cleveland-Lorain
Cleveland, OH
Lorain, OH
Fairport Harbor, OH
11 Columbia River
Portland, OR
Vancouver, WA
Longview, WA
Kalama, WA
12 Corpus Christi, TX
13 Delaware River
New Castle, DE
Wilmington, DE
Marcus Hook, DE
Chester, PA
Paulsboro, NJ
Philadelphia, PA
Camden-Gloucester, NJ
14 Detroit
Detroit, MI
St. Clair, MI
Marine City, MI
Monroe, MI
15 Duluth-Superior, MN and WI
16 Honolulu, HI
17 Houston-Galveston
Houston, TX
Galveston, TX
Texas City, TX
Freeport, TX
18 Huntington, IN
19 Jacksonville, FL
20 Lake Charles, LA
21 Los Angeles-Long Beach, CA
22 Memphis, TN
23 Mobile, AL
24 New York-New Jersey
25 Norfolk-Newport News
Norfolk, VA
Newport News, VA
26 Pascagoula, MS
27 Pittsburgh, PA
28 Portland, ME
29 Presque Isle, MI
30 Puget Sound
Seattle, WA
Tacoma, WA
Everett, WA
Olympia, WA
31 San Francisco Bay
San Francisco, CA
Oakland, CA
Richmond, CA
32 San Juan, PR
33 Savannah, GA
34 South Florida
Miami, FL
Port Everglades, FL
35 South Louisiana
Port of South Louisiana
New Orleans, LA
Baton Rouge, LA
Plaquemine, LA
36 St. Louis, MO
37 Tampa, FL
38 Toledo, OH
39 Valdez, AK

Figure 2-10
Largest Transit Markets: 1997



NOTE: Large transit markets are defined as having more than 200 million transit passenger-miles. Alaska has no large transit markets, so it is not shown.
SOURCE: U.S. Department of Transportation, Federal Transit Administration, National Transit Database, 1997.

ble—78 percent in 1997—but there has been no improvement since 1994 (see figure 2-11).

Transit speeds varied greatly in 1997, from commuter rail at 33.8 mph—the fastest—to bus, which at 12.9 mph was the slowest. Heavy rail was the second fastest with an average speed of 20.7 mph, followed by demand responsive vehicles (14.7 mph), and light rail (15.5) (USDOT FTA 1999).

Property damaged during transit operations is another performance measure. In 1997, directly operated transit was responsible for $55.7 million in property damage, and purchased transportation service was responsible for another $5 million.[22] This totals $1.39 per 1,000 revenue passenger-miles in 1997, about the same as in 1993, when accounting for inflation (USDOT FTA 1999).

Rail

Revenue ton-miles reached 1,349 billion in 1997, an increase of 47 percent since 1980, although revenue-ton miles increased only 16 percent in the eastern United States, but climbed

[22] A transit agency may provide transit service itself (directly operated service) or contract with another public or private entity (purchased transportation).

Table 2-13
Urban Transit Indicators: 1987 and 1997 (thousands)

	Revenue vehicle-miles			Passenger miles			Ridership (unlinked trips)		
	1987	1997	Change (%)	1987	1997	Change (%)	1987	1997	Change (%)
Demand responsive	113,100	350,076	210	176,800	531,078	200	28,800	88,203	206
Bus	1,484,334	1,605,721	8	17,094,900	17,509,219	2	4,794,300	4,602,031	–4
Commuter rail	169,901	229,608	35	6,806,300	8,037,486	18	311,000	357,199	15
Heavy rail	473,921	539,670	14	11,198,000	12,056,068	8	2,402,100	2,429,455	1
Light rail	18,015	39,802	121	404,400	1,023,708	153	131,300	259,404	98
Ferryboat	1,559	2,015	29	114,100	254,219	123	18,800	42,048	124
Total	**2,281,275**	**2,853,330**	**25**	**36,102,300**	**40,180,219**	**11**	**7,847,900**	**7,982,371**	**2**

SOURCE: U.S. Department of Transportation, Federal Transit Administration, *National Transit Database, 1987, 1997* (Washington, DC: 1989, 1999).

to 68 percent in the western United States (AAR 1998, 61). Figure 2-12 illustrates the geography of rail tonnage.

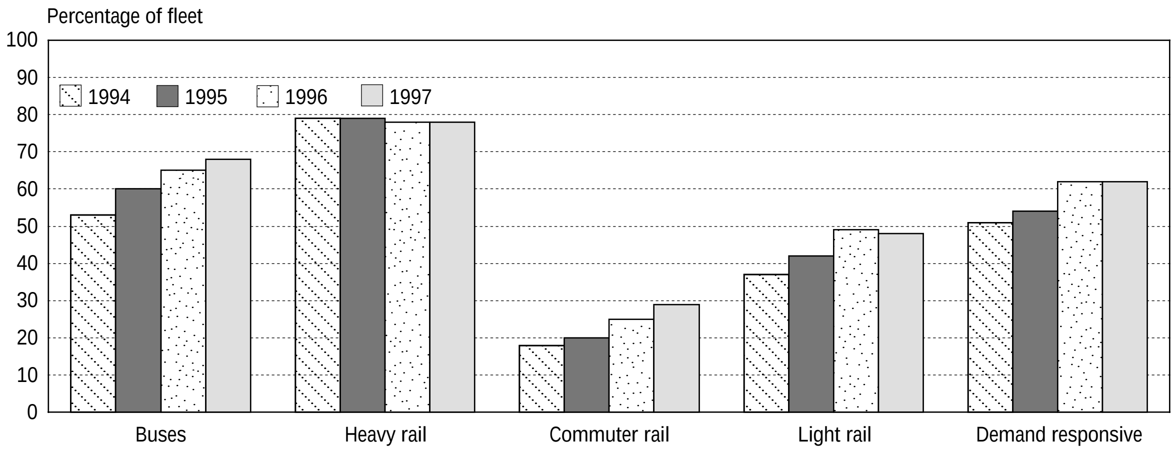
Figure 2-13 shows that intermodal (trailer or container on flatcar) and coal are the largest categories of rail traffic, each accounting for approximately one-quarter of the carloadings of the railroad industry. Intermodal traffic increased from 3.1 million loadings in 1980 to 8.7 million in 1997 (AAR 1998). The introduction of doublestack container trains in the early 1980s played a major role in this growth. Since the late 1970s, when the Powder River Basin opened in Wyoming, coal shipments grew from 4.4 million carloads in 1978 to 6.7 million carloads in 1997, reflecting the increased demand for low sulfur western coal by electric utilities to comply with clean air standards (AAR 1980; 1998). A combination of chemicals, motor vehicles and equipment, and farm products account for roughly 20 percent of rail traffic.

Table 2-14 presents 1997's top 10 state-to-state rail freight flows, as well as the major commodities handled for these flows. These 10 flows accounted for 17 percent of all rail carloads and 15 percent of all rail tonnage. Miscellaneous mixed shipments (i.e., intermodal traffic), which accounted for 67 percent of all rail intermodal traffic, and coal are the major commodities for 7 of these 10 flows. The largest rail intermodal flows in the United States were between California and Illinois predominantly representing the U.S. land portion of U.S. exports to and imports from Asia's Pacific Rim countries. The largest coal flows originated in the Powder River Basin and terminated at electric power generating plants in Illinois, Texas, and Missouri.

Freight rates (freight revenue per ton-mile) adjusted for inflation declined 2 percent per year between 1993 and 1997, and 1 to 2 percent per year since the passage of the Staggers Act in 1980, compared with an increase of nearly 3 percent per year between 1975 and 1980.[23] From 1993 to 1997, the Class I freight railroads averaged an 8 percent return on their net investment, up from an average of 2 percent in the 1970s[24] (AAR Various years).

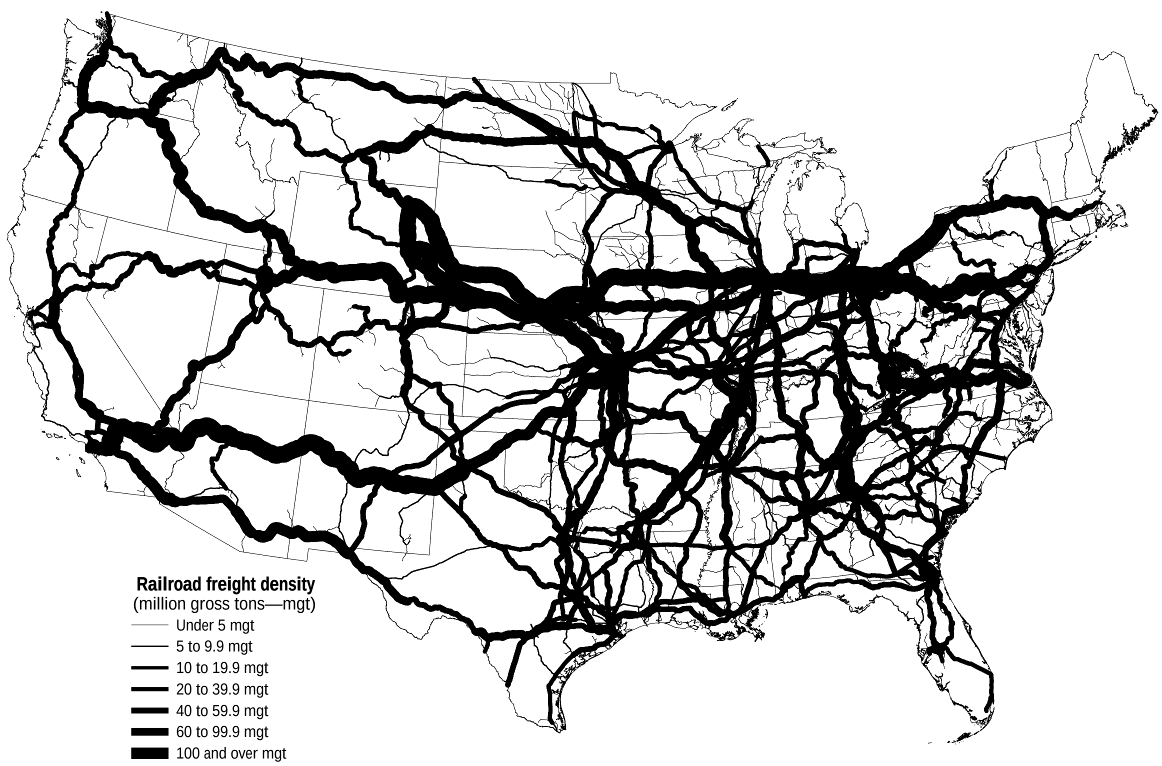
[23] Calculated using the Bureau of Labor Statistics' Producer Price Index for Line-Haul Operating Railroads (SIC 4011).
[24] In 1997, Class I railroads had operating revenues of $256.4 million or more.

Figure 2-11
ADA-Accessible Vehicles by Mode: 1994–97



SOURCE: U.S. Department of Transportation, Federal Transit Administration, *1996 National Transit Summaries and Trends* (Washington, DC: 1998), p. 25.

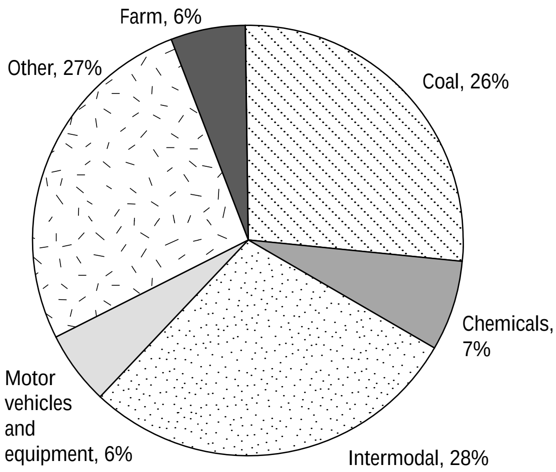
Figure 2-12
Railroad Network Showing Volume of Freight: 1997



NOTE: Alaska and Hawaii are not shown here as they have no railroad networks.

SOURCE: U.S. Department of Transportation, Federal Railroad Administration.

Figure 2-13
Rail Carload Mix: 1997



SOURCE: Association of American Railroads, *Railroad Facts, 1998* (Washington, DC: 1998).

Railroad labor productivity grew from 4.2 million revenue ton-miles per employee in 1988 to 7.6 in 1997 (USDOT BTS 1998a). Because of railroad mergers over the past few years, crews are smaller and fewer freight interchanges between railroads are necessary. Revenue ton-miles increased due to more frequent and heavier traffic moving longer distances.

The value of goods damaged in 1997 was $113 million. Although the total damage done has increased from the late 1980s, the rate has declined 40 percent from $142 per million ton-miles in 1988 to $84 in 1997 (AAR 1980; 1998).

While freight rail traffic increased, passenger rail traffic remained relatively constant. There were 20.2 million Amtrak passengers in fiscal year (FY) 1997, about the same number as in FY 1987. Amtrak's passenger load factor, however, has declined over the past decade, decreasing from 53 percent in 1988 to 47 percent in 1997 (NRPC 1996; 1999).

Amtrak operated approximately 22,000 route-miles in FY 1997, serving 516 stations and providing 11.1 billion available seat-miles. Accessibility to service decreased, however, with Amtrak providing service to 26 fewer stations than in the previous year, the fewest number of stations served since 1990. This is down only slightly from Amtrak's average over the past decade of 523 stations (Amtrak 1999).

Table 2-14
Top 10 State Rail Freight Flows and Major Commodities: 1997

			Total flow		Major commodity		
Rank	Origin state	Destination state	Carloads (thousands)	Tons (thousands)		Carloads (thousands)	Tons (thousands)
1	IL	CA	793	13,782	Misc. mixed shipments[a]	510	8,259
2	FL	FL	768	57,501	Nonmetallic minerals	419	41,356
3	CA	IL	753	11,827	Misc. mixed shipments[a]	580	8,172
4	TX	TX	557	45,425	Nonmetallic minerals	172	16,627
5	WY	IL	382	43,573	Coal	355	41,160
6	WY	TX	372	38,936	Coal	352	37,060
7	TX	CA	372	10,669	Misc. mixed shipments[a]	221	4,032
8	MN	MN	365	28,334	Metallic ores	308	23,280
9	IL	NJ	364	6,870	Misc. mixed shipments[a]	288	4,200
10	WY	MO	362	40,365	Coal	357	39,900

[a] In 1997, miscellaneous mixed shipments accounted for 67 percent of all rail intermodal (trailer on flatcar/container on flatcar shipments).

SOURCE: U.S. Department of Transportation, Federal Railroad Administration,Carload Waybill Sample, 1997.

The quality of Amtrak's passenger rail service in 1997 was not significantly different from trends established over the past decade, though slight fluctuations in individual performance statistics were observed. Amtrak's on-time percentages between 1988 and 1997 do not show much fluctuation. Shorter trips (i.e., those under 400 miles) were more reliable, arriving on schedule 79 percent of the time in 1997. Trains on longer trips were less punctual, arriving on schedule just over half of the time (53 percent). Amtrak trains experienced a total of 25,800 hours of delay in 1997. Of this total, 18 percent of the delays were due to Amtrak, 52 percent to freight railroads, and the remaining 30 percent to other factors, including weather (NRPC 1999).

According to Amtrak, overall consumer satisfaction is rising. The systemwide consumer satisfaction index rose from 81 in FY 1995 to 84 in FY 1997 (based on a 100-point scale). This index represents customer satisfaction with a wide range of factors such as facility cleanliness, service, reservations, and bathrooms, as taken from customer surveys.

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